

AMENDMENT

This listing of claims will replace all prior versions, and listings, of claims in the application.

- 1 1. (Currently Amended) An apparatus for use in seismic surveying ~~adapted for seismic data~~
2 ~~acquisition~~ in a land or transition zone environment, said apparatus comprising:
 - 3 a positioning device;
 - 4 a seismic sensor, capable of being placed near said positioning device; and
 - 5 means for determining the distance between said seismic sensor and said positioning
 - 6 device using an airborne acoustic transmission between said positioning device
 - 7 and said seismic sensor.
- 1 2. (Original) An apparatus as claimed in claim 1, in which said airborne acoustic
2 transmission is produced by a speaker at said positioning device and received by a microphone at
3 said seismic sensor.
3. (Canceled)
4. (Canceled)
5. (Canceled)
6. (Canceled)
7. (Canceled)
8. (Canceled)
9. (Canceled)
10. (Canceled)
11. (Canceled)
12. (Canceled)

13. (Canceled)
14. (Canceled)
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31. (Canceled)
32. (Canceled)
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34. (Canceled)
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38. (Canceled)
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40. (Canceled)
41. (Canceled)
42. (Canceled)

43. (Canceled)

44. (Canceled)

45. (Canceled)

1 46. (Previously Presented) The apparatus of claim 2, wherein said airborne acoustic
2 transmission received by said microphone at said seismic sensor is converted from analog to
3 digital format using an analog to digital converter that is also used to convert seismic signals
4 received by said seismic sensor from analog to digital format.

1 47. (Previously Presented) The apparatus of claim 2 wherein said airborne acoustic
2 transmission received by said microphone at said seismic sensor is transmitted using a cable that
3 is also used to transmit seismic data received by said seismic sensor.

1 48. (Previously Presented) The apparatus of claim 1, wherein said airborne acoustic
2 transmission is a spread spectrum acoustic signal.

1 49. (Previously Presented) The apparatus of claim 1, wherein said airborne acoustic
2 transmission is a pulse, frequency sweep, or digitally encoded sweep acoustic signal.

1 50. (Previously Presented) The apparatus of claim 1, wherein said airborne acoustic
2 transmission is generated by signal generation circuitry that is also used to test said seismic
3 sensor.

1 51. (Previously Presented) The apparatus of claim 1, further including a temperature sensor
2 for measuring the temperature of the air near said seismic sensor or said positioning device.

1 52. (Previously Presented) The apparatus of claim 1, further including a survey flag and
2 wherein said positioning device is placed near said survey flag.

1 53. (Previously Presented) The apparatus of claim 1, wherein said positioning device is a first
2 positioning device and further including a second positioning device and means for determining
3 the distance between said second positioning device and said seismic sensor using an airborne
4 acoustic transmission between said second positioning device and said seismic sensor.

1 54. (Previously Presented) The apparatus of claim 53, further including means for
2 determining the distance between said first positioning device and said second positioning
3 device.

1 55. (Previously Presented) The apparatus of claim 54, wherein said means for determining
2 the distance between said first positioning device and said second positioning device uses an
3 airborne acoustic transmission between said first positioning device and said second positioning
4 device.

1 56. (Previously Presented) The apparatus of claim 53, wherein said first positioning device
2 and said second positioning device are connected by a cable.

1 57. (Previously Presented) The apparatus of claim 53, wherein said second positioning device
2 is placed at a predetermined azimuthal orientation with respect to said first positioning device.

1 58. (Previously Presented) The apparatus of claim 53, further including means for confirming
2 that said second positioning device has been placed at a predetermined azimuthal orientation
3 with respect to said first positioning device.

1 59. (Previously Presented) The apparatus of claim 53, wherein a seismic source signal is used
2 to resolve the line symmetry ambiguity when determining the position of said seismic sensor
3 with respect to said first positioning device and said second positioning device.

1 60. (Previously Presented) The apparatus of claim 1, wherein said seismic sensor is a first
2 seismic sensor and further including additional seismic sensors and means for determining the
3 distance between said additional seismic sensors and said positioning device using airborne
4 acoustic transmission between said positioning device and said additional seismic sensors.

1 61. (Previously Presented) The apparatus of claim 60, further including means for calculating
2 a group center of gravity for said first seismic sensor and said additional seismic sensors.

1 62. (Previously Presented) The apparatus of claim 60, further including means for
2 determining whether said first seismic sensor and said additional seismic sensors have been laid
3 out in a prescribed order.

1 63. (Previously Presented) The apparatus of claim 1, wherein said seismic sensor and said
2 positioning device are located at a first seismic station and further including an additional
3 positioning device located at a second seismic station and means for determining the distance
4 between a device located at said first seismic station and a device located at said second seismic
5 station.

1 64. (Currently Amended) A method for use in a seismic survey of determining the position of
2 a seismic sensor adapted for seismic data acquisition in a land or transition zone environment,
3 said method comprising the steps of:

4 placing a positioning device in a particular location;
5 placing a seismic sensor near said positioning device; and
6 determining the distance between said seismic sensor and said positioning device using
7 an airborne acoustic transmission between said positioning device and said
8 seismic sensor.

1 65. (Previously Presented) The method of claim 64, wherein said airborne acoustic
2 transmission is produced by a speaker at said positioning device and received by a microphone at
3 said seismic sensor.

1 66. (Previously Presented) The method of claim 65, wherein said airborne acoustic
2 transmission received by said microphone at said seismic sensor is converted from analog to
3 digital format using an analog to digital converter that is also used to convert seismic signals
4 received by said seismic sensor from analog to digital format.

1 67. (Previously Presented) The method of claim 65, wherein said airborne acoustic
2 transmission received by said microphone at said seismic sensor is transmitted using a cable that
3 is also used to transmit seismic data received by said seismic sensor.

1 68. (Previously Presented) The method of claim 64, wherein said airborne acoustic
2 transmission is a spread spectrum acoustic signal.

1 69. (Previously Presented) The method of claim 65, wherein said airborne acoustic
2 transmission is a pulse, frequency sweep, or digitally encoded sweep acoustic signal.

1 70. (Previously Presented) The method of claim 64, wherein said airborne acoustic
2 transmission is generated by signal generation circuitry that is also used to test said seismic
3 sensor.

1 71. (Previously Presented) The method of claim 64, further including the step of measuring
2 the temperature of the air near said seismic sensor or said positioning device.

1 72. (Previously Presented) The method of claim 64, wherein said positioning device is placed
2 near a survey flag.

1 73. (Previously Presented) The method of claim 64, wherein said positioning device is a first
2 positioning device and further including the step of determining the distance between a second
3 positioning device and said seismic sensor using an airborne acoustic transmission between said
4 second positioning device and said seismic sensor.

1 74. (Previously Presented) The method of claim 73, further including the step of determining
2 the distance between said first positioning device and said second positioning device.

1 75. (Previously Presented) The method of claim 74, wherein said step of determining the
2 distance between said first positioning device and said second positioning device uses an
3 airborne acoustic transmission between said first positioning device and said second positioning
4 device.

1 76. (Previously Presented) The method of claim 73, wherein said first positioning device and
2 said second positioning device are connected by a cable.

1 77. (Previously Presented) The method of claim 73, wherein said second positioning device
2 is placed at a predetermined azimuthal orientation with respect to said first positioning device.

1 78. (Previously Presented) The method of claim 73, further including the step of confirming
2 that said second positioning device has been placed at a predetermined azimuthal orientation
3 with respect to said first positioning device.

1 79. (Previously Presented) The method of claim 73, wherein a seismic source signal is used
2 to determine to resolve the line symmetry ambiguity when determining the position of said
3 seismic sensor with respect to said first positioning device and said second positioning device.

1 80. (Previously Presented) The method of claim 64, wherein said seismic sensor is a first
2 seismic sensor and further including additional seismic sensors and the step of determining the
3 distance between said additional seismic sensors and said positioning device using airborne
4 acoustic transmissions between said positioning device and said additional seismic sensors.

1 81. (Previously Presented) The method of claim 80, further including the step of calculating a
2 group center of gravity for said first seismic sensor and said additional seismic sensors.

1 82. (Previously Presented) The method of claim 80, further including the step of determining
2 whether said first seismic sensor and said additional seismic sensors have been laid out in a
3 prescribed order.

1 83. (Previously Presented) The method of claim 64, wherein said seismic sensor and said
2 positioning device are located at a first seismic station and further including an additional
3 positioning device located at a second seismic station and the step of determining the distance
4 between a device located at said first seismic station and a device located at said second seismic
5 station.

1 84. (Previously Presented) The method of claim 64, further including the steps of recording
2 seismic data acquired by said seismic sensor and assigning sensor position coordinates to said
3 seismic data based on said distance between said seismic sensor and said positioning device.

1 85. (Previously Presented) The method of claim 64, further including the step of calculating a
2 deviation between actual seismic sensor position coordinates and planned seismic sensor position
3 coordinates.

1 86. (Previously Presented) The method of claim 85, further including the step of
2 compensating for said deviation between said actual seismic sensor position coordinates and said
3 planned seismic sensor position coordinates.

1 87. (Previously Presented) The method of claim 86, wherein said compensation step includes
2 mathematically moving a group center of gravity from an actual position to a planned position.

1 88. (Previously Presented) The method of claim 87, wherein said compensation step includes
2 bypassing a digital ground roll removal process.